

## **Woodcutting Activities in Tabuk Region (Saudi Arabia): Assessment of Conservation Knowledge**

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**Abstract** - The present study aims to investigate the effect of different social factors on the woodcutting frequency in Tabuk Region. A total of 100 people participated in this study by answering the questionnaire questions. The conservation knowledge of the participants was also assessed through 4 questions (Yes or No). The final score of the conservation knowledge assessment is 4. The present study findings showed that most of people like to cut the wood for heating during winter and fall seasons. The frequency of woodcutting in Tabuk Region was once a month. Among the social factors involved in this study, education showed negative and significant relationship with the number of logging times. However, age had positive relationship with the number of logging times. The most favourable species to be cut and used for heating and cooking in Tabuk are; *Acacia tortilis*, *Acacia ehrenbergiana*, *Retama reetam* and *Calligonum comosum*. For the assessment of the public conservation knowledge, it was found that most of participants had moderate to good conservation knowledge as most of them answered 3 questions correctly out of 4. The conservation knowledge showed to be affected positively by education level and negatively by the number of family members. In conclusion, it was found that there is remarkable woodcutting stress on wild plants in Tabuk Region and immediate and effective actions should be performed.

**Keywords** : Woodcutting; Tabuk Region; Conservation knowledge; Plant diversity

### **Introduction**

Plant community plays an important role in sustainable management by maintaining biodiversity and conserving the environment (Kandi *et al.*, 2011). It is well known that the global ecosystem undergoes intensive and unreasonable exploitation to its resources. This is associated with continuous deterioration in the natural biodiversity of plants and animals. There is growing demand for wooded products as they provide wide range of service to human being in all parts of the world (Ramos and Albuquerque, 2012, do Nascimento *et al.*, 2013, Nuberg, 2015). However, extraction of these services from the wooded ecosystems raises the concern to the adverse effect on natural biodiversity and ecosystem functioning (Pote *et al.*, 2006). In the world, 54% of forestry natural resources are used as fuelwood (Bhatt and Sachan, 2004) implying the importance of wood as energy sources. However, this is increasing demand is associated with significant forest loss (Brouwer and Falcao, 2001). Therefore, different studies were conducted in various parts of the world to assess the exploitation of wooded ecosystems as energy resources to be used for various human usages (e.g. heating and cooking) in both urban and rural areas (Mahapatra and Mitchell, 1999, Tabuti *et al.*, 2003, Ramos *et al.*, 2008, Cardoso *et al.*, 2012, Martinez, 2015). However, such knowledge still very lacking especially in rural areas where other energy sources are limited or absent (Ramos and Albuquerque, 2012).

Saudi Arabia (Lat. 32° 34' N – 16° 83' N, long 34° 36' E – 56° E) is a vast arid desert with an area of about 2, 250,000 sq kms covering the major part of the Arabian Peninsula. Although Arabian Peninsula is known for its unique flora, there is continuous deterioration of the plant biodiversity due to unsustainable use of the environmental resources. The publications on the flora of Saudi Arabia include the illustrated flowers of Saudi Arabia by Collett (1999) and a number of reports on regional or local floras of certain parts of the kingdom; examples include the studies of Hosni and Hegazy (1996) on Asir region and Al-Turki (1997) on Al-Qassim region, and Al-Turki and Al-Olyan (2003) and El-Ghanim *et al.* (2010) on Hail region. Unfortunately, the arid and semi-arid regions undergo severe wood cutting problem which is associated with increasing demands of wood as fuel for heating, cooking and coal production (Alssaied and Al-Qarawi, 1996). The knowledge among the people is very limited as the wood cutting is no more necessary with availability of other energy sources.

Wood cutting has been identified as an important reason behind continuous deterioration of plant vegetation in different countries (for Saudi Arabia see Allred, 1968). In Saudi Arabia, it was estimated that 40000 hectares is being destroyed every year because of wood cutting activities. This associated with remarkable decrease in

the number of rare plant species. Eventually, this will lead to irreversible changes in the natural environment and emergence of environmental problems such as carbon dioxide emission and global warming. This tragedy continues despite existence of some strict rules and regulations about wood harvesting.

Alssaed and Al-Qarawi (1996) have identified the most favourable plant species to be harvest for cooking and heating in several parts of Saudi Arabia. *Acacia tortilis* is common plant species for the arid and semi-arid regions in the Arabian Peninsula. Most of people prefer using this species for heating and cooking because of the acceptable smell during burning and its fire longevity. Another favourable species for cooking and heating in Saudi Arabia is *Haloxylon persicum* and *Calligonum comosum* which they grow in sand dunes and it is important for desertification. The present study was conducted to assess the effect of different social factors on the rate and frequency of woodcutting. The threatened species by the woodcutting activities were identified. This study also aims to evaluate the conservation knowledge about the adverse effect of woodcutting on natural diversity of plants and the environment integrity.

## Materials and Methods

### Study design and questionnaire development

The study was conducted among residents of Tabuk. A total of 100 subjects were involved in this study. The research questionnaire was adopted from previous study of Alnafie (2000) and was designed to be consisted of three parts. The first part contains necessary personal information including, age, education level, number of family members, residence (city, village, farm or rural), and type of residence (apartment, villa or tent). However, the second part of this study questionnaire consists of 8 questions to evaluate the woodcutting attitude and practice among the respondent. This part of the questionnaire also measured the favourable season for woodcutting as well as the main purpose of woodcutting and the sources of the wood. The third part of the questionnaire consisted of 4 direct questions (yes or no) to measure the conservation knowledge of the participants.

### Statistical analysis

The descriptive statistics were obtained using the software package of SPSS (version 13.5). The descriptive statistics include the frequencies, mean, and standard deviation for the questionnaire items. The one way ANOVA was carried out to investigate the variation of woodcutting activities in different seasons. The Pearson correlation test at significance level of 0.05 was conducted to examine the relationships between the conservation knowledge versus education level, age and residence.

## Results and Discussion

Assessment of conservation knowledge of the using the wood has been conducted in several countries such as Brazil (Martinez, 2015), Papua New Guinea (Nuberg, 2015) and Argentina (Cardoso *et al.*, 2012). A total of 100 people participated in this study. The present study questionnaire was designed to investigate the residents' attitude toward woodcutting in Tabuk Region, Saudi Arabia. It was also used to study the preference of woodcutting seasons and plant species. The conservation knowledge of the participants was assessed via 4 different questions measuring their knowledge about the adverse effect of woodcutting on environment and natural diversity. The number of woodcutting times differed significantly among the four seasons (Kruskal-Wallis  $\chi^2 = 15.16$  and  $P < 0.05$ ). The most favourable seasons for woodcutting were winter with percentage of 42% followed by fall (22%).

The descriptive statistics of the study samples are shown here. In terms of education, most of the participants have completed secondary school with percentage of 43% (Figure 1a). According to the present study findings, the mean purpose for woodcutting is for heating with percentage of 90% as shown in the Figure 1b. Most of participants responded that they cut the plants by themselves as shown in the Figure 2a in at least once a month (Figure 2b). The most favourable species to be cut and used for heating and cooking in Tabuk are; *Acacia tortilis*, *Acacia ehrenbergiana*, *Retama raetam* and *Calligonum comosum*. The favourable place for obtaining these woods in Tabuk Region are Shawaq, Dhubaa, Aloaola, Albadeah and Alhadhab.

The present study revealed negative significant relationship was found between number of logging times and education (Kendall's tau correlation,  $r = -0.268$ ,  $P = 0.002$ ). However, positive significant relationship was detected between number of logging times and age (Kendall's tau correlation,  $r = 0.202$ ,  $P = 0.011$ ). Interestingly, positive significant relationship was found between education and conservation knowledge (Kendall's tau correlation,  $r = 0.208$ ,  $P = 0.013$ ). However, in big families where the family members is high, conservation knowledge was rather low as negative and significant relationship was found between number of family members and conservation knowledge (Kendall's tau correlation,  $r = -0.162$ ,  $P = 0.039$ ).

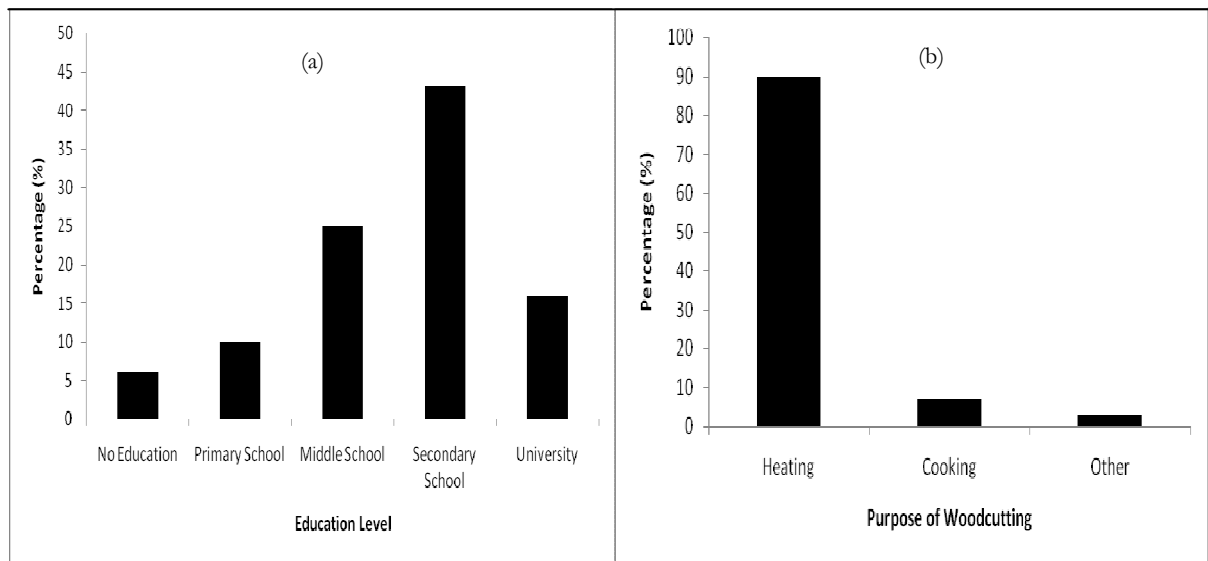


Figure 1. (a) Frequency of education among the participants, (b) Frequency of the "purpose" of woodcutting among the residents of Tabuk Region. N=100.

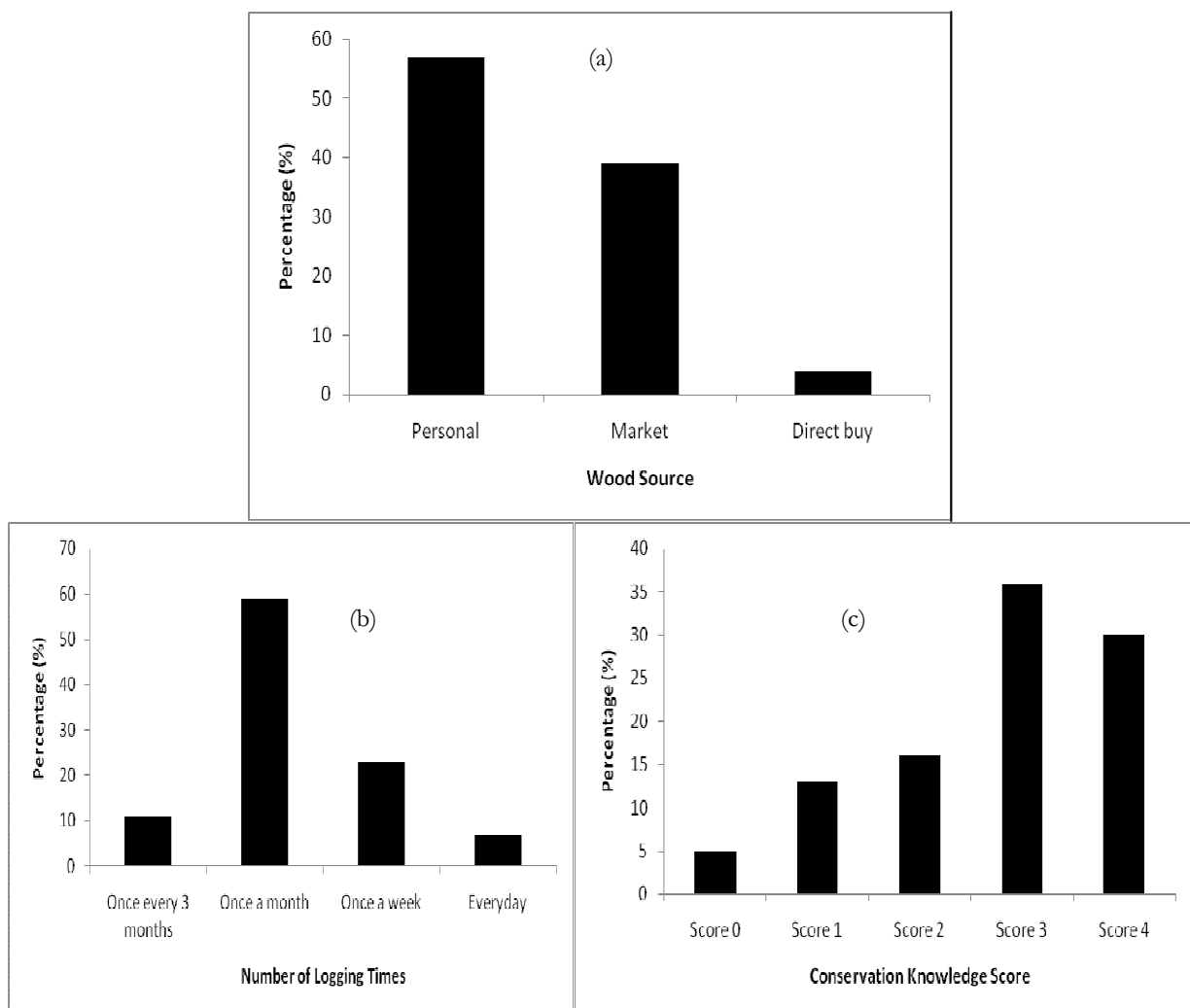


Figure 2. (a) Frequency of the wood sources among the residents of Tabuk Region, (b) Frequency of the number of logging times among the residents of Tabuk Region, (c) Frequency of conservation knowledge scores on the adverse effect of woodcutting among residents of Tabuk Region. N=100

The present study considered to be the first report that addressed the effect of different social factors on the rate and frequency of woodcutting in Tabuk Region. The present findings revealed that four species are the most favourable species for their wood in Tabuk Region including *Acacia tortilis*, *Acacia ehrenbergiana*, *Retama raetam* and *Calligonum comosum*. *Acacia tortilis* was the most favourable plant for wooding and these findings are in agreement with the study of Alsaeed and Alqarawi (1996) who found that 5 plant species of *Acacia tortilis*, *Calligonum comosum*, *Haloxylon persicum*, *Anabasis articulata* and *Hammada elegans* are the preferable species for logging and using them for heating and cooking in Saudi Arabia.

The present study showed the main purpose for woodcutting in Tabuk region is heating as 90% of contributed participants stated that the main reason they log the wood is to be used for heating. This was corresponding to the preferable season for woodcutting as it occurred during winter and fall seasons. The frequency of woodcutting was once a month which reflects the stress on natural plants due to the growing demands of woods. The present study findings are in agreement with the previous study of Alnafie (2000) who found that the main purpose of woodcutting in Saudi Arabia is for heating. Despite that, very low percentage (<0.5%) of the correspondents in the study of Alnafie (2000) depend solely on wood as the main source of energy in Saudi Arabia.

Here, there was an attempt to understand the factors affecting the number of logging times. Positive relationship was found between age of participants and the number of logging times. However, the number of logging times was negatively affected by the education level. This implies that low education is corresponding to increasing the woodcutting. Meanwhile, educated people are somewhat aware about the adverse effect of woodcutting on environment and natural diversity of plants. This was also proven by the direct positive relationship found between education level and conservation knowledge score. However, small families (i.e. low number of family members) tends to have better conservation knowledge compared to bigger families as direct and positive relationship was shown between conservation knowledge score and number of family members.

In conclusion, it would be fitting to emphasize here that the Tabuk Region undergoes remarkable stress of woodcutting that may threaten the natural diversity of plants in this region. The *Acacia tortilis* and *Acacia ehrenbergiana* are the most endangered species in this region. There is a necessity for activating and enforce the laws that regulate the woodcutting in sustainability way. The intensive education programs and house-house extension programs should be carried out to increase the conservation knowledge and awareness among the residents of this region. Furthermore, different media (newspaper, television and radio) should start launching education program on conservation of natural diversity and the importance of sustainable environment.

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